

CHILDREN'S HEALTH

Less Pollution, Less Earache?

Children exposed to secondhand cigarette smoke suffer more ear infections. Irritating toxicants in cigarette smoke, such as carbon monoxide (CO) and sulfur dioxide (SO₂), also are constituents of vehicular emissions, so it's not surprising that children exposed to high levels of traffic pollution also have more ear infections, as shown by studies published in the September 2006 *EHP* and the May 2007 *European Respiratory Journal*. In the newest twist on the air pollution/ear infection connection, researchers have linked improvement in U.S. air quality over a decade with a reduction in the prevalence of pediatric ear infections.

Otolaryngologists Nina Shapiro of the University of California, Los Angeles, and Neil Bhattacharyya of Harvard University obtained data for 126,060 children, mean age 8.6 years, collected as part of the National Health Interview Survey between 1997 and 2006. Shapiro and Bhattacharyya identified cases of frequent otitis media (defined in the survey as three or more ear infections in the previous 12 months), respiratory allergy, and seizures. Seizures were included as a control condition believed to be unrelated to air pollution. Data on concentrations of CO, SO₂, nitrogen dioxide (NO₂), and particulate matter (PM) for the same 10-year period came from the U.S. Environmental Protection Agency (EPA). Elevated levels of all four pollutants are strongly associated with deficits in respiratory health.

During the study period, air quality steadily improved, and the incidence of recurrent ear infections fell, but the incidence of allergy or seizures did not change. SO₂ and NO₂ were more strongly associated with frequent otitis media than were CO and PM. The researchers reported the results at the American Academy of Otolaryngology—Head and Neck Surgery Foundation national meeting in October 2009. Bhattacharyya elaborates, in figures not presented at the meeting, that in 1997 there were about 5.8 million cases of children with frequent otitis media, whereas by 2006, the number of frequent otitis media cases had fallen to 4.1 million.

These preliminary results suggest it may be possible to “track the effects of environmental pollution on one disease, in this case ear infections, and see if children benefit from a greener Earth,” says Udayan Shah, co-director of fellow and resident education in pediatric otolaryngology at Nemours–Al DuPont Hospital for Children in Wilmington, Delaware. The findings, while intriguing, will need to be confirmed in studies of individual children.

Exactly how air pollutants might contribute to otitis media remains unknown. However, all four toxicants are known to cause inflammation that restricts the movement of respiratory cilia that clear toxicants. “The lining of the middle ear is similar to the respiratory tract mucosa,” notes Shapiro, suggesting that similar mechanisms may be involved. In a study published in the April 1989 (part 1) issue of the *Annals of Otolaryngology, Rhinology, and Laryngology*, Y. Ohashi and colleagues found that SO₂ depressed cilia function in guinea pigs' ears.

The Clean Air Act revisions of 1990 strengthened the EPA's enforcement of stringent regulations aimed at improving air quality to benefit the nation's health, with the added benefit of reducing medical costs. In the February 2004 issue of *EHP*, Eva Y. Wong and colleagues estimated that reductions in air pollution by 2010 as a result of the Clean Air Act could save up to \$2 billion in children's respiratory health costs alone. If the current findings bear out, the savings could be substantial for otitis media costs, which may exceed \$5 billion annually, according to a report in the June 2000 issue of *Pediatrics*.

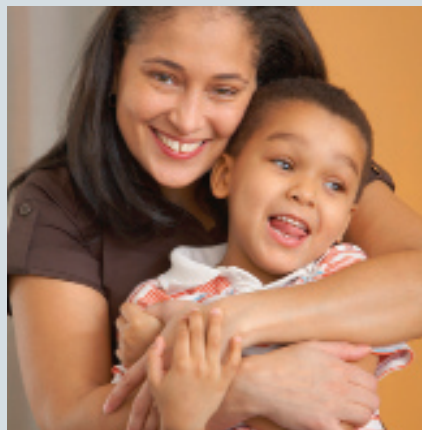
In future projects, Shapiro and Bhattacharyya will explore how changes in average annual temperature relate to respiratory illnesses in adults and children. In the first study of this type, Bhattacharyya found a statistically significant association between increased prevalence of sinusitis and increased annual temperatures between 1998 and 2006, as described in the October 2009 issue of *The Laryngoscope*.

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The Beat by Erin E. Dooley

Young and Restless

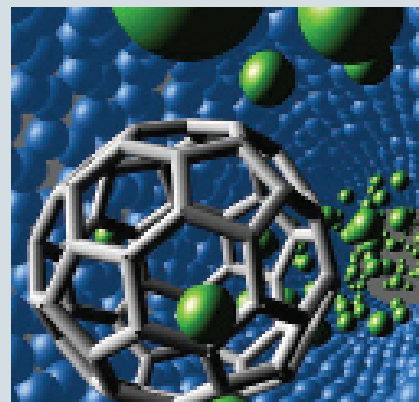
In work published online 3 Nov 2009 in the *Journal of Epidemiology and Community Health*, sons of women who reported smoking heavily in pregnancy were nearly twice as likely as sons of nonsmokers to exhibit restlessness



and distractibility at age 3 years. Despite limitations—potential underreporting of smoking in pregnancy, dependence on parental reports of behavior, and unmeasured maternal characteristics that could influence child behavior—the study supports earlier animal findings that cigarette smoke exposure *in utero* affected neurologic development in fetuses. Jayne Hutchinson and colleagues write that studies in this cohort using teacher assessments of behavior at older ages may yield valuable insights.

Nanotech Summit Highlights Business Needs

Research Triangle Park, North Carolina, played host to the Research Triangle Environmental Health Collaborative's second annual summit in October 2009. The summit focused on environmentally responsible development of nanotechnology, including critical environmental health issues faced by businesses in the development and manufacturing of nanomaterials. A guidance document with recommendations for business and policy makers will be forthcoming.



Acetaminophen May Spur Asthma

A review in the Nov 2009 issue of *Chest* indicates acetaminophen use may be associated with as much as a 75% increased risk of developing asthma and wheeze in adults and a 60% increase in children. Senior author J. Mark FitzGerald and colleagues are attempting to help explain why asthma rates have risen over the past 30 years. Over this same period physicians began advising patients to use acetaminophen rather than aspirin

RESEARCH ISSUES AND INITIATIVES

NIEHS Funds Human BPA Research

With \$14 million in stimulus funds from the American Recovery and Reinvestment Act, the NIEHS is bolstering a coordinated effort to produce data on bisphenol A (BPA) that will help refine our understanding of whether the general population's current exposures to the chemical pose a health risk. Used in producing plastics, BPA can leach into food and beverages from everyday items such as food storage containers, water bottles, and baby bottles.

The NIEHS has used the stimulus monies to fund 10 two-year studies on the potential contribution of low-dose BPA to problems such as obesity, diabetes, reproductive disorders, asthma, sexually dimorphic behaviors, cardiovascular diseases, and prostate, breast, and uterine cancer. Those grants augment ongoing work on BPA by researchers in the NIEHS Intramural Division and at the National Toxicology Program (NTP).

Many animal studies suggest exposure to low doses of BPA during critical periods of fetal development may result in adverse reproductive, behavioral, and carcinogenic changes over the long term. However, fewer studies have examined whether or how the effects seen in animals translate to humans. In 2008 the U.S. Food and Drug Administration (FDA) declared BPA safe, with an updated ruling pending at press time. But regardless of what the FDA decides at this point, scientists involved in BPA research agree more human data are needed for the compound.

"Policy makers and regulatory agencies such as the FDA are constantly looking at new data, and we're hoping that the data we will provide in the next two years will have a significant impact in helping them [continue to assess] the health effects of this chemical," says Jerry Heindel, a health scientist administrator at the NIEHS.

Coordinating the new effort with research already under way will yield a more comprehensive understanding of BPA while also maximizing resources, says Linda S. Birnbaum, director of the NIEHS and the

NTP. "We saw the stimulus package award as a real opportunity to bring together the ongoing NIEHS work, the NTP work, and these new projects to clearly answer the question of how much of a problem BPA may or may not be," Birnbaum says. In total, including the stimulus funds, the institute will invest approximately \$30 million over two years on BPA-related research.

Many of the awardees met with institute scientists involved in ongoing BPA research in October 2009. "Having the key players talking to one another as they begin new research efforts will stimulate collaboration, create opportunities to share resources, and encourage researchers to develop reliable and reproducible methods that will allow for a comprehensive assessment of the human health effects of BPA," Heindel explained in an NIEHS press release.

The group will continue to meet periodically and share data and tissue samples. For example, one of the new grantees, B. Paige Lawrence, an associate professor at the University of Rochester School of Medicine, is studying whether BPA influences immune-mediated diseases, but some of the data from her study may also provide clues to the chemical's potential role in cancers. "The same types of cells and pathways that fight viral infections also detect and destroy tumor cells," she says.

The new effort is crucial to getting results from human studies quickly, says grantee Kim Harley, an epidemiologist at the University of California, Berkeley, who will study BPA levels and health outcomes in a birth cohort of 300 children followed through age 12. "We haven't focused on BPA before," she says, "but we have this valuable cohort as well as urine samples stored, so with this grant we can measure BPA levels and start to see the effects in children all the way to puberty."

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because of aspirin's link to Reye syndrome. This life-threatening disorder can affect people of all ages, although it is perhaps most notorious for affecting children. Further prospective studies are required to better understand the acetaminophen-asthma connection, and the authors do not recommend abandoning acetaminophen as a treatment for flu symptoms in children.

Sensor for Pesticides in Foods

In the 1 Nov 2009 issue of *Analytical Chemistry*, Zakir Hossain and colleagues describe a new biosensor they have developed that works more quickly and cheaply than conventional methods to detect small amounts of organophosphate and carbamate pesticides in foods and beverages. Conventional methods can take hours to reveal such contaminants, but the new bioactive paper sensor provides results in minutes. The researchers note their method could be especially useful in developing countries, which often lack access to electricity and expensive testing equipment.

The Temperature of Conversion

A new study reveals that most land use changes in the United States lead to local and regional increases in surface temperature, with the greatest increases occurring with urbanization and conversion to bare soil. But Souleymane Fall and colleagues also report that conversion of land to agricultural uses resulted in cooler temperatures even if the land was previously forested, perhaps because of increased evaporation. These findings add to a growing body of knowledge that highlights the necessity of incorporating land use changes into climate change models. The paper appeared online 24 Aug 2009 ahead of print in the *International Journal of Climatology*.

Phones and Bones

In a study of 150 male cell phone users, Tolga Atay and colleagues found that wearing a belt-mounted phone was associated with decreased bone density in the pelvic iliac wing closest to the phone—perhaps, they suggest, due to exposure to electromagnetic fields (EMFs). Although the reduction in bone

density was not statistically significant, the authors note the men in their study were relatively young (21–57 years old). If the reductions resulted from exposure to EMFs from the phones, the effect could grow with continued use. (Conversely, very weak EMFs have been used successfully to stimulate healing in broken bones.) The report appeared in the Sep 2009 issue of *The Journal of Craniofacial Surgery*.

